Contribution ID: **214** Type: **Poster**

Matching Curved Lattices to Anisotropic Tangent Planes

Tuesday, 30 July 2024 18:15 (1 hour)

Radial quantization would be the ideal formalism for studying strongly-coupled conformal and near-conformal quantum field theories but it requires the ability to perform lattice calculations on static, curved manifolds, specifically a very long cylinder whose cross section is a sphere. Smoothly discretizing the surface of a sphere requires a graph with unequal edge lengths. The geometry of such graphs is well understood since 1961 using Regge Calculus. But, lattice quantum field theories are defined in terms of couplings which appear in the action rather than edge lengths and so the relationship between couplings and lengths must be determined dynamically. A simple example is computing the ratio of spatial to temporal lattice spacings in anisotropic lattice QCD. I will discuss our progress in solving the critical 3D Ising model on a fully anisotropic FCC lattice, which is a necessary input to solving the critical 3D Ising model on a 3-sphere.

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Session Classification: Poster session and reception

Track Classification: Theoretical Developments